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ABSTRACT

This report presents information describing labor market conditions for scientists and engineers, focusing only on those scientists and engineers who hold scientific or engineering (S/E) jobs. The scope of this report consists of an analysis of trends in the seventies, an attempt to identify in a qualitative way some of the factors that underlie these trends, and methodological details summarized in the technical notes. Employment data are summarized for major S/E fields, major employment sectors of the economy, and for scientists and engineers primarily engaged in research and development and teaching. (DS)

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foreword

This report presents an important addition to the array of information describing labor market conditions for scientists and engineers. It provides a new time series of employment data—employment in science and engineering. The series, which was developed from a variety of data sources, is unique in that it covers only those scientists and engineers who hold scientific or engineering (S/E) jobs. The S/E job descriptor is a more sensitive gauge of employment opportunities in scientific and technical positions than the series for scientists and engineers covering employment in both technical and nontechnical positions.

This study was devoted primarily to the development of the new data series by an estimating process described briefly in the Introduction and more fully in the appendix. The scope of the report consists of an analysis of trends in the seventies, an attempt to identify in a qualitative way some of the factors that underlie these trends, and methodological details summarized in the technical notes. Employment data are summarized for major S/E fields, major employment sectors of the economy, and for scientists and engineers primarily engaged in research and development and teaching.

Charles E. Falk, Director
Division of Science Resources Studies
Directorate for Scientific, Technological,
and International Affairs

March 1981

acknowledgments

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highlights

- This report is based on a new series of estimates of scientists and engineers employed in S/E jobs (S/E employment) which was developed from a variety of sources. S/E employment is considered a more sensitive gauge of demand for scientific and technical skills than total employment of scientists and engineers, which includes those working in any occupation.
- Almost 90 percent of the increase in S/E employment over the 1970-80 decade was linked to increases in overall economic activity (as measured by total U.S. employment). Employment in S/E jobs increased 32 percent from 1970 through 1980, compared with 28 percent for total U.S. employment. In earlier periods (1950-70) only 50 percent of the employment increase could be attributed to increases in such activity.
- The growth in S/E employment was not evenly distributed over the seventies. It grew substantially faster in the second half of the decade than in the first (19 percent, or 3.5 percent per year vs. 11 percent, or 2.2 percent per year). Moreover, there appears to have been a significant increase in recent years in the rate of employment growth. Since 1978 the growth rate of S/E employment has averaged over 5 percent per year.
- Over the decade the distribution of the S/E work force has shifted from engineering into computer specialties. Engineering, however, has enjoyed a relative resurgence in the latter half of the decade. After sluggish growth in the early seventies, S/E employment opportunities for engineers grew dramatically in the latter seventies. About 80 percent of the 1970-80 S/E employment growth for engineers occurred between 1975 and 1980. In contrast, the bulk of the decennial S/E employment growth for computer specialists occurred in the first half of the decade.
- S/E employment growth for scientists was more evenly distributed over the decade. Within science, there was a shift towards environmental scientists and psychologists. The control and abatement of environmental pollution and domestic exploration for petroleum and other minerals stimulated the demand for environmental scientists. The strong employment increases for psychologists reflect several factors, including increasing concern for the development of human resources.
- The proportion of S/E employment in the various sectors remained stable over the decade. In both 1970 and 1980, business/industry employed about two-thirds, academia about 15 percent, and the Federal Government about 8 percent.
- The number of scientists and engineers primarily employed in R&D activities increased by about 33 percent over the decade, at rates similar to that for all scientists and engineers. Over 75 percent of the growth took place between 1975 and 1980, partially in response to increased R&D funding.

introduction

Gross employment statistics provide useful information about the utilization of scientists and engineers. By themselves, however, these data do not present a complete picture because some scientists and engineers, although employed, are working in jobs that do not involve S/E activity. Thus, failure to account for the nature of the employment activity as well as the employment status of scientists and engineers can result in misleading conclusions. For example, if one examines only employment status, one finds that in recent years employment of scientists has been growing at a faster rate than that of engineers (8 percent vs. 2 percent between 1976 and 1978). If, however, one also considers the nature of the employment—i.e., in this case, whether or not it involves S/E activity—and one focuses on employment in S/E activity (hereafter referred to as "S/E employment") the findings are reversed. The rate of growth in S/E employment for engineers exceeds that of scientists (7-percent increase vs. 8-percent decrease, respectively).

Employment estimates shown in this report represent an effort by the National Science Foundation (NSF) to develop a historical series that accounts for both employment status and the nature of the employment activity, i.e., an S/E employment series. These estimates differ from employment information generally published by NSF in that they are not based on survey data. Rather, they have been generated from available NSF data on 1978 S/E employment levels and indexes of changes in these levels derived from other comparable data sources. Appendix A outlines the methods and data sources used in generating these S/E employment estimates.

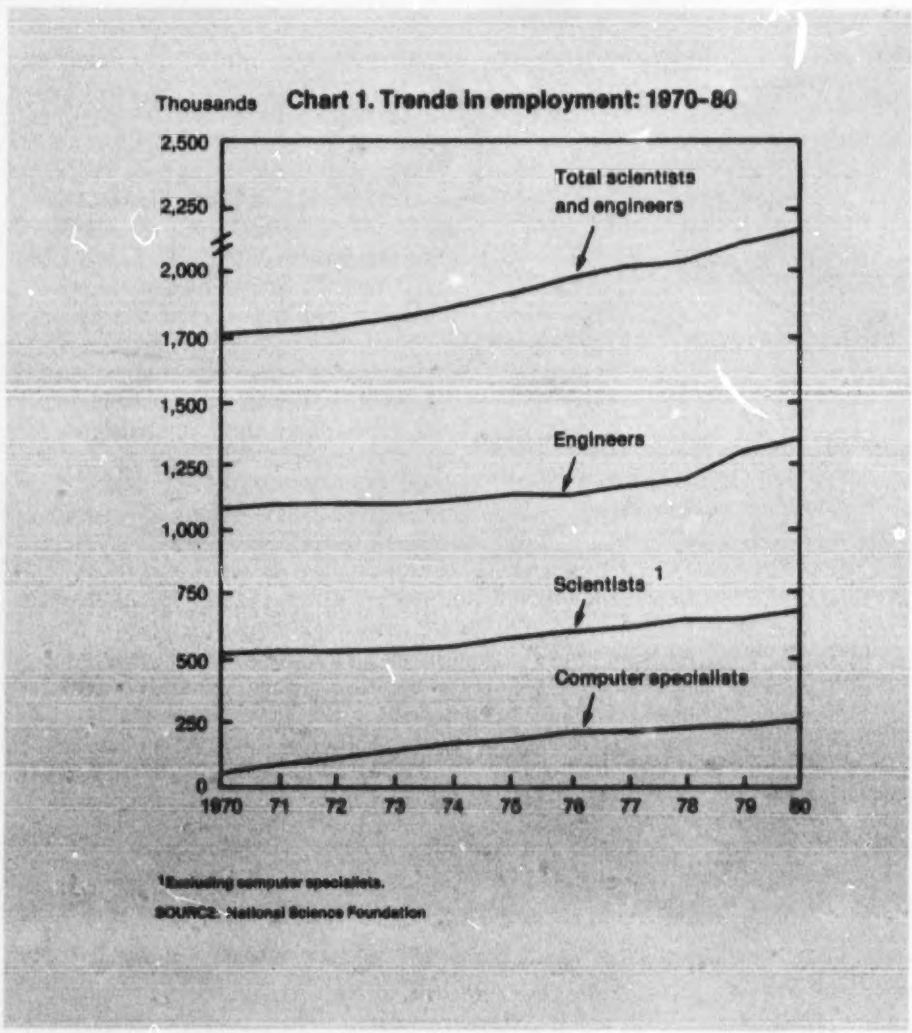
s/e employment growth

S/E employment continued its long-term upward trend between 1970 and 1980 (chart 1). The growth rate was more rapid in the second half of the decade than in the first (19 percent vs. 11 percent). The rate of increase over the entire decade is similar to the overall growth in total employment. Thus, S/E employment as a percent of the total work force remained at about 2.5 percent.[1] This relative stability in work-force share contrasts with the 1950 to 1970 period when employment of scientists and engineers increased twice as fast as that of the total work force.[2]

There are various factors that influence the demand for scientists and engineers. Among these are the level of R&D activities and Federal expenditures, particularly for defense and space programs.

Almost one-third of the 1970-80 increase in S/E employment resulted from growth in the number primarily employed in research and development. R&D employment contributed over one-third of the growth during the latter part of the seventies; it represented about one-fifth of the growth during the early seventies.

In constant dollars, Federal Government expenditures grew slowly in the early seventies (about 0.3 percent per year between 1970 and 1973), reflecting defense and space program cutbacks that dramatically affected S/E employment opportunities, particularly for engineers. Constant-dollar Federal expenditures grew more rapidly after 1973 (about 0.6 percent per year between 1973 and 1979), but did not contribute significantly to the S/E employment growth in the late seventies since much of the growth was in programs that do not utilize large numbers of scientists or engineers. A significant fraction of this latter growth in Federal expenditures was in non-defense areas, especially for income security programs.



[1] Civilian employment in nonagricultural industries, as reported in Department of Labor, Bureau of Labor Statistics, *Employment and Earnings* (Washington, D.C.: Supt. of Documents, U.S. Government Printing Office, 1980).

[2] The data for the pre-1970 trends in S/E employment excludes social scientists. For a more detailed examination of the trends, see Department of Labor, Bureau of Labor Statistics, *Employment of Scientists and Engineers, 1950-1970*, Bulletin 1781 (Washington, D.C.: Supt. of Documents, U.S. Government Printing Office).

occupational trends

S/E growth for computer specialists was more than twice that of other scientists or engineers, reflecting the effect on employment demand of rapid growth in the use of computer technologies (chart 2). S/E employment of computer specialists almost doubled over the seventies. S/E employment for the rest of the S/E occupations (excluding computer specialists) increased at much slower rates (33 percent and 24 percent). For this reason, computer specialists are treated separately in the subsequent discussions of scientists.

scientists

scientists (excluding computer specialists)

S/E employment of scientists increased by about 170,000 in the 1970-80 period to about 700,000. This growth was spread evenly over the decade. S/E employment grew by 13 percent in the first half of the decade and by about 17 percent in the second half. Within science (excluding computer specialists), there was a shift in S/E employment toward environmental sciences and psychology. These two fields accounted for over one-third of the growth but represented only about one-fifth of all employed scientists in 1980. Roughly one-half the growth in employment in these two fields took place in business/industry.

Employment of environmental scientists increased in response to the stimulation of domestic exploration for petroleum and other minerals, research on new energy sources, and activities related to the control and abatement of environmental pollution.[3] Several factors contributed to the strong S/E employment increases for psychologists, including increasing concern for the development of human resources, heightened awareness of the need to test and counsel children, and the introduction of benefits in health insurance programs for treatment by psychologists.[4]

computer specialists

Employment of computer specialists almost doubled between 1970 and 1980. Unlike engineers and other scientists, growth in the employment of computer specialists was concentrated in the first half of the decade. In the earlier period (1970-75), employment of computer specialists increased by 58 percent, while in the second half of the decade, employment increases slowed to about 17 percent.

The pronounced growth in employment of computer specialists was facilitated by the flexibility of the S/E personnel pool. For example, 7 percent of the stock of employed mathematical scientists in 1972 had become employed as computer specialists by 1978. Similarly, 6 percent of those employed as physical scientists and over 1 percent of those employed as engineers in 1972 switched to employment as computer specialists by 1978.[5]

engineers[6]

S/E employment of engineers increased by about 270,000 in the 1970-80 period, reaching almost 1.4 million. More than 80 percent of the growth took place between 1975 and 1980, chiefly in the business/industry sector. Engineering employment grew by 5 percent between 1970 and 1975, and by 19 percent per year between 1975 and 1980. The significantly faster growth during the latter part of the decade reflected improved business conditions in the latter part of the seventies and increased R&D activities. A significant fraction of employed engineers is involved in both research and development and in management/administration.

Business/industry employed about four of every five engineers in both 1970 and 1980. Employment of engineers in this sector increased by 24 percent over the decade, reaching about 1.1 million in 1980.

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[3] It should be noted that substantial portions of other S/E occupation groups are also involved in environmental and energy-related activities. In 1978 roughly 10 percent of all scientists and engineers were in environment-related activities, and 14 percent in energy-related activities.

[4] Department of Labor, Bureau of Labor Statistics, *Occupational Outlook Handbook, 1980-81 Edition* (Washington, D.C.: Supt. of Documents, U.S. Government Printing Office, March 1980).

[5] Information for five fields of engineering, e.g., civil, mechanical, etc., was not sufficient to develop time series estimates. Recent data for five fields of engineering can be found in National Science Foundation, *U.S. Scientists and Engineers, 1978* (Detailed Statistical Tables) (NSF 80-304) (Washington, D.C., 1980).

[6] National Science Foundation, *Occupational Mobility of Scientists and Engineers* (NSF 80-317) (Washington, D.C., 1980).

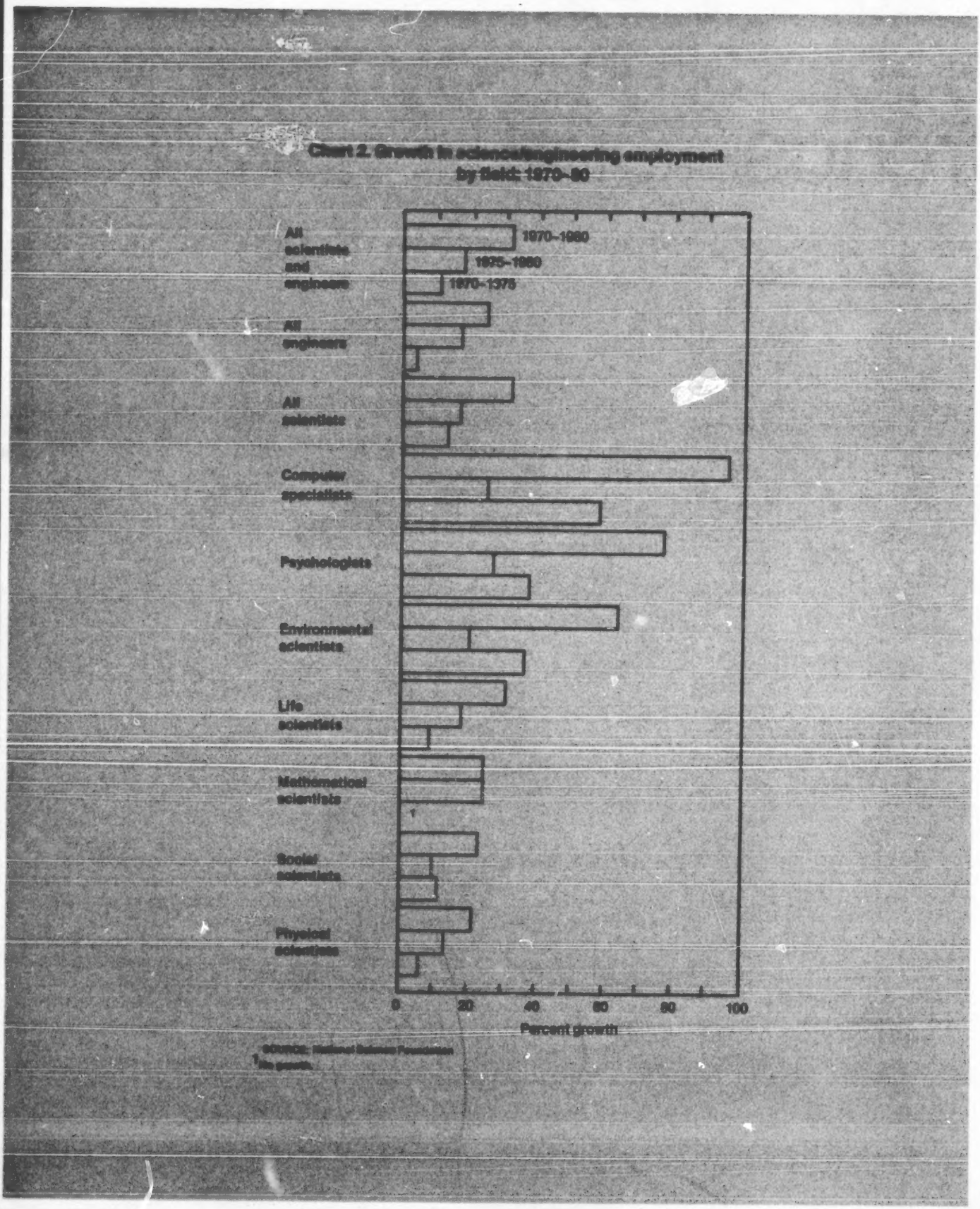
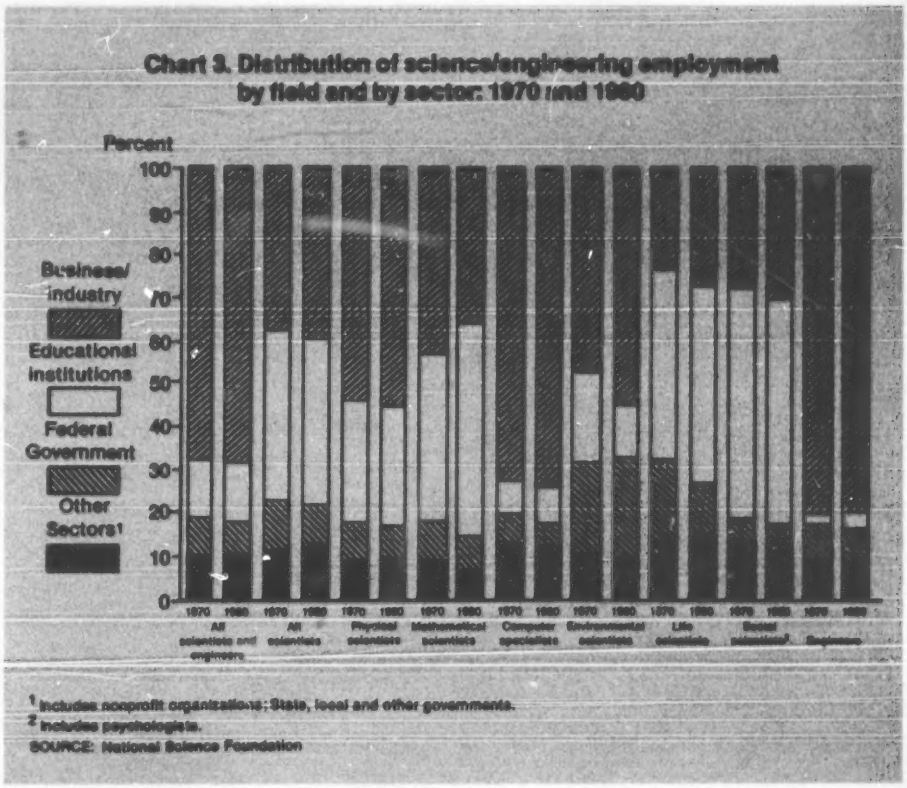


Chart 2. Growth in science/engineering employment by field: 1970–80
All scientists and engineers
All engineers
All scientists
Computer specialists
Psychologists
Environmental scientists
Life scientists
Mathematical scientists
Social scientists
Physical scientists
1970–1980
1975–1980
1970–1975
0
20
40
60
80
100
Percent growth
SOURCE: National Science Foundation
1 No growth.

sectoral employment trends

Sectoral demands for scientists and engineers influence both the primary work activities and the fields in which these personnel are employed. For example, overall growth in the industrial sector would have a greater impact on engineers than on social scientists, who work primarily in educational institutions. Similarly, growth in the educational sector can affect such activities as teaching.

The sectoral distribution of employed scientists and engineers has remained relatively stable over the decade of the seventies; in both 1970 and 1980, about two-thirds were employed in business and industry (chart 3).



business/-industry

Almost 1.6 million scientists and engineers were employed in the business/industry sector in 1980, about one-third more than in 1970. Almost two-thirds of the increase occurred between 1975 and 1980 (chart 4). The first half of the decade was marked by relatively lower economic growth, with real business output increasing by less than 2.5 percent per year[7] and total employment increasing by 1.3 percent per year.[8]

Over the decade S/E employment opportunities in this sector shifted away from physical, mathematical, and social sciences and into computer specialties, psychology, and environmental sciences (chart 5). These field shifts reflect the increasing importance of meeting environmental regulations and energy demands and the increased role of the service industries in the private sector relative to that of the manufacturing industries.[9] Employment opportunities for engineers, however, which were relatively poor during the first half of the decade, improved substantially in the second half of the decade.

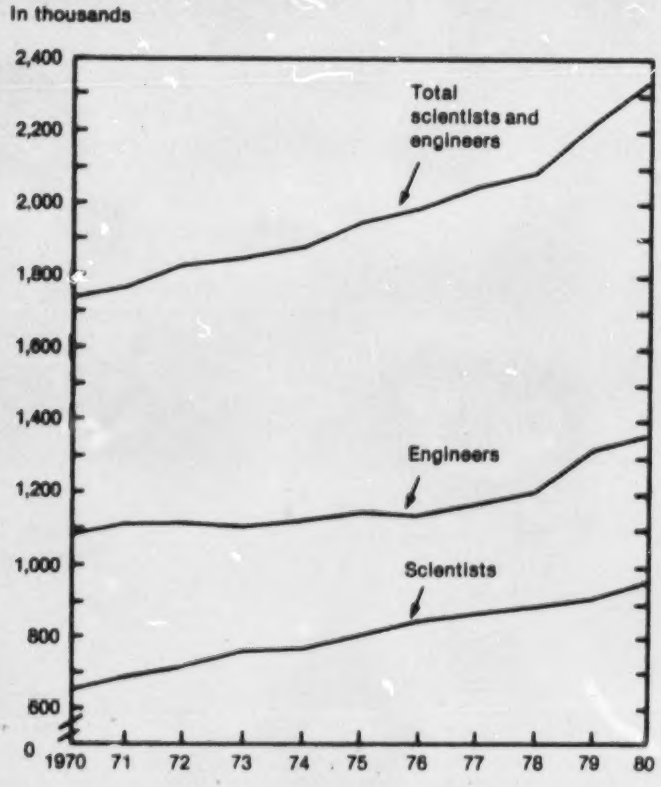
S/E employment of scientists and engineers primarily engaged in research and development in business/industry increased over the decade at a rate roughly similar to that for total S/E employment (about 33 percent). When computer specialists—relatively few of whom are involved in research and development—are eliminated from the analysis, the number primarily engaged in R&D activities increases more rapidly than total S/E employment (34 percent vs. 27 percent).

[7] Council of Economic Advisers, *Economic Report of the President, 1980* (Washington, D.C.: Supt. of Documents, U.S. Government Printing Office, 1980), table B-10.

[8] Department of Labor, Bureau of Labor Statistics, *Employment and Earnings*, August 1980, table B-7, op. cit.

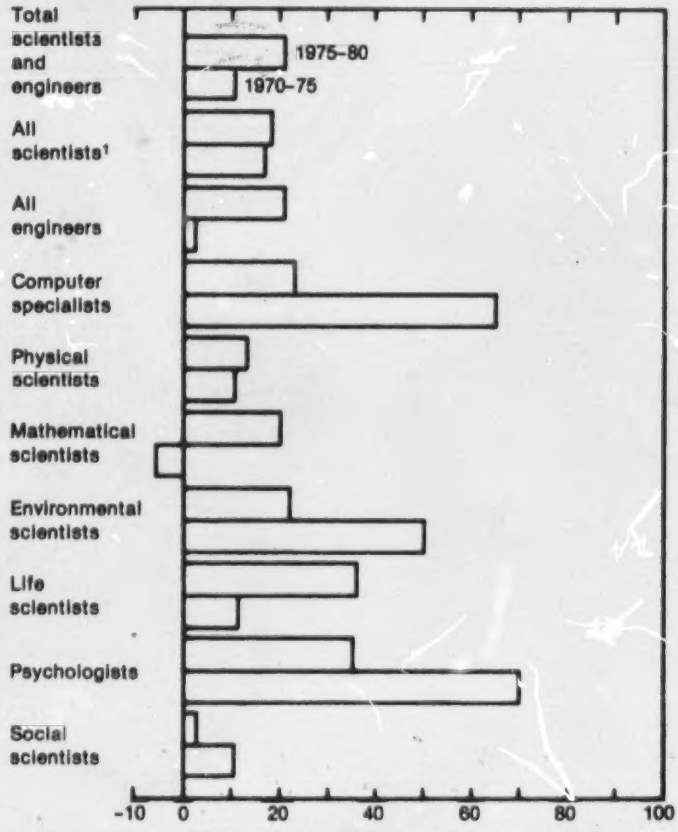
[9] See National Science Foundation, *Scientists, Engineers, and Technicians in Private Industry: 1978-80* (NSF 80-320) (Washington, D.C.: Supt. of Documents, U.S. Government Printing Office, 1981), p. 10.

Chart 4. Trends in science/engineering employment in industry: 1970–80



SOURCE: National Science Foundation

Chart 5. Science/engineering employment growth in industry by field: 1970–75 and 1975–80



[1]Excluding computer specialists. SOURCE: National Science Foundation

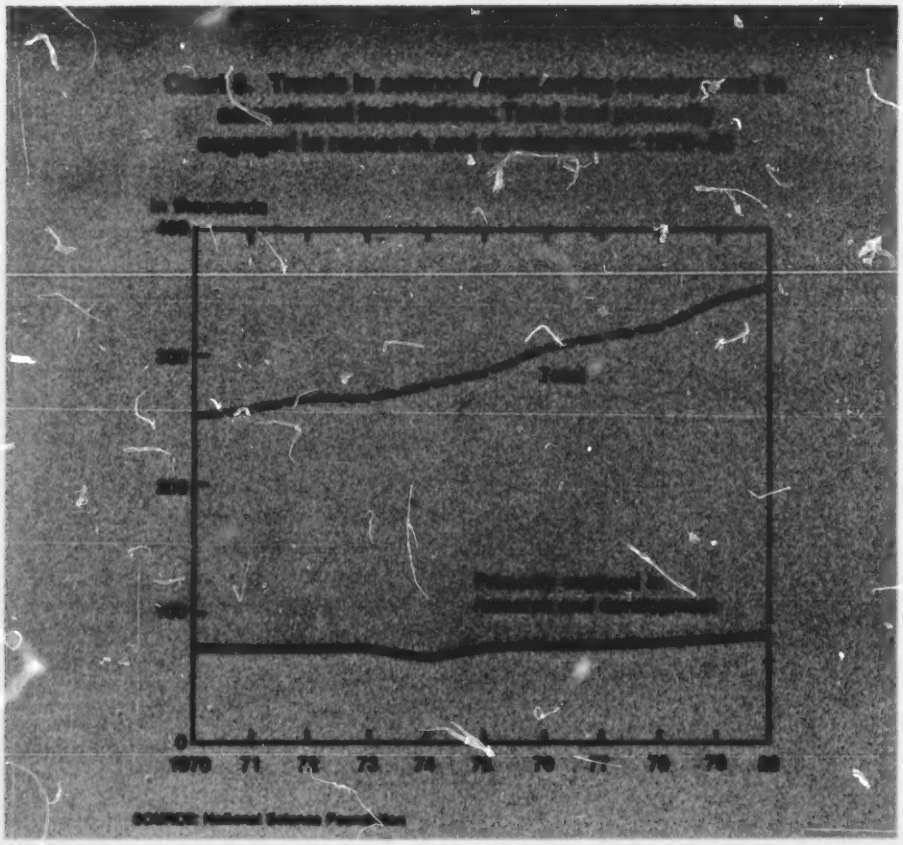
educational institutions[10]

S/E employment in educational institutions was over 350,000 in 1980, about 40 percent more than in 1970. Approximately three-fifths of the growth took place between 1975 and 1980 (chart 6). Accompanying the S/E employment growth that occurred in this sector was a shift in the nature of the activities undertaken by these personnel, particularly in the latter part of the seventies, when the relative share of teaching fell. Between 1970 and 1975, the number primarily engaged in research and development remained essentially stable, while the number of S/E personnel primarily engaged in teaching increased. Between 1975 and 1980, the number primarily engaged in research and development increased more rapidly than the number primarily employed in teaching (22 percent vs. 17 percent).

This shift in activities was the result of a number of factors, including demographic trends and changes in Federal policy with respect to R&D funding. There was a marked increase in the rate of growth of R&D funding for educational institutions over the decade,[11] while at the same time demographic factors have caused a slowdown in the rate of growth in enrollments.

[10] This sector includes 2- and 4-year colleges, universities and medical schools. In addition, a small number of Ph.D scientists employed in secondary schools are included in this sector (about 2,500 in 1978).

[11] National Science Foundation, *National Patterns of Science and Technology Resources, 1980* (NSF 80-308) (Washington, D.C.: Supt. of Documents, U.S. Government Printing Office, 1980).



federal government

S/E employment in the Federal Government was almost 175,000 in 1980, about 18 percent higher than it was in 1970. Federal S/E employment showed less growth in the seventies than any other sector. Like the other sectors, however, growth was slightly greater in the last half of the decade (9.5 percent between 1975 and 1980 vs. 7.5 percent between 1970 and 1975). Although employment increased in most fields, roughly 85 percent of the increase in Federal S/E employment was accounted for by engineers and computer specialists.

r&d scientists and engineers

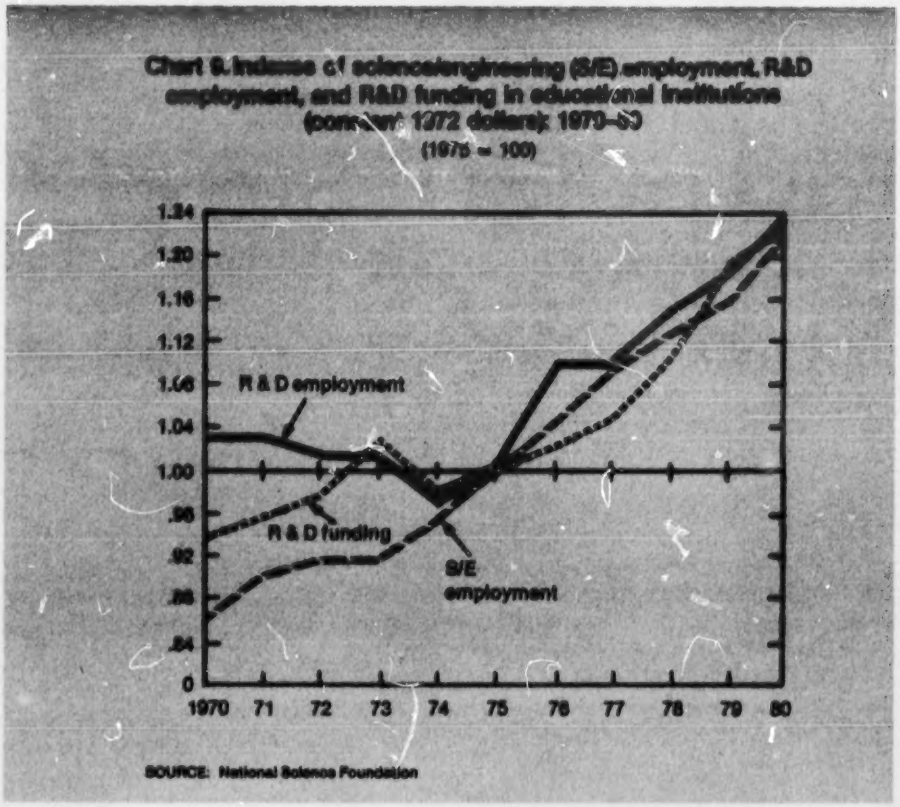
S/E employment primarily in research and development increased over the decade at rates similar to those for all scientists and engineers (33 percent). Over 75 percent of this increase, however, took place between 1975 and 1980.

Except for 1979-80, recent growth in R&D employment generally parallels increased constant-dollar R&D funding (chart 7), primarily for the development of alternative energy resources. The relative growth in R&D employment between 1979 and 1980 was substantially greater than the relative growth in constant-dollar R&D funding. It is premature to identify this as a new trend. If this differential growth persists in future years, however, it would produce a decrease in real R&D funding per R&D employee.

Over 70 percent of the S/E employment primarily in R&D activities was in the business/industry sector in 1980. R&D employment in industry increased substantially between 1975 and 1980, almost 30 percent as compared to less than 6 percent between 1970 and 1975 (chart 8). Several factors generated this growth, including increased industrial R&D funding, improved industrial sales and profits, increased Federal funding of industrial research and development in energy-related activities, and industry

response to Government regulations in areas such as environmental pollution, food and drug production, and public safety.[12]

S/E employment primarily in research and development in educational institutions was 82,000, or 12 percent of the total in 1980. This employment declined slightly during the first half of the decade as R&D spending by universities and colleges increased minimally, by about 7.5 percent (chart 9). Increasing R&D costs more than offset any positive employment effects this small growth in expenditures might have produced. S/E employment growth in R&D pursuits in educational institutions resumed in the last half of the decade, rising by 23 percent, as constant-dollar expenditures for research and development increased by over 4 percent per year, primarily in response to increased Federal and other support to academe.[13]



[12] Ibid., p. 8.
[13] Ibid., p. 7.

appendixes

a. technical notes
b. statistical tables

appendix a

technical notes

scope and coverage

Generally, NSF publishes estimates of the number and characteristics of persons who meet its particular definition of a scientist or engineer. A person is considered a scientist or engineer if he or she meets at least two of the following criteria:

(1) Holds a degree in a field of science or engineering;
(2) Is employed in an S/E occupation; and/or
(3) Self-identifies as a scientist or engineer based on total education and work experience.[1]

The field in which a respondent is classified—for example, chemistry—is that in which two of the three criteria coincide. Based on these general NSF criteria, employed scientists and engineers do not necessarily work in S/E jobs. In 1978, about 85 percent of those employed were in S/E jobs. Since this percentage is not stable, trends will vary according to whether the broad (total) or the narrow (S/E) definition of employment is used.

The estimates of S/E employment by field of science or engineering in this report are not synonymous with estimates of employment by occupation. Persons are considered working in science and engineering if they meet the aforementioned general criteria and if they answered affirmatively to a question such as, "Were you working in a position related to science or engineering?" Thus, a person with a degree in chemistry who professionally identifies as a chemist and indicates employment in an S/E field other than chemistry would be classified as an employed "chemist." This individual, however, may not be employed as a "chemist."

method of estimation

These estimates were generated from two sets of statistics: (1) 1978 data on S/E employment developed from the NSF Scientific and Technical Personnel Characteristics System (STPCS);[2] and (2) estimates of the ratio of employment in any given target year, t, to comparable employment in 1978. The latter set of statistics, which are index numbers indicating relative employment differences from a 1978 base, were generated for each of 15 fields of science and engineering. In addition, separate indexes were generated for these fields for each of four sectors of the economy. Finally, indexes were also generated for all scientists and engineers for each of three types of work activity in each sector of the economy.

The method used in developing the estimates of S/E employment can be summarized as follows. Let:

$(S/E)_{it}$ = S/E employment in field i, year t

$(S/E)_{i1978}$ = S/E employment, field i, 1978, from STPCS

I_{it} = index of employment in field i,

$$\text{year } t = \frac{O_{it}}{O_{it1978}}$$

where:

O_{it} = employment in occupation i, year t

O_{i1978} = employment in occupation i, 1978

O_i, a subset of S/E_i, includes only those who are employed in occupation i. By comparison S/E_i includes not only O_i, but also includes those members of field i who are employed in other S/E occupations.

[1] See National Science Foundation, *U.S. Scientists and Engineers: 1978* (Detailed Statistical Tables) (NSF 80-304) for a more detailed description of these criteria. (Washington, D.C., 1980).

[2] See *ibid.* for a complete description of this system.

The estimates of S/E employment were generated from the following equation:

$$(S/E)_{it} = (S/E)_{i1978} \times I_{it}$$

This method of estimation assumes that relative changes in S/E employment are equal to relative changes in occupational employment—i.e., that

$$\frac{O_{it}}{O_{i1978}} = \frac{(S/E)_{it}}{(S/E)_{i1978}}$$

Alternatively, the method assumes that employment in occupation i was a constant fraction of S/E employment in field i over this period—i.e., that

$$\frac{O_{it}}{(S/E)_{it}} = \frac{O_{i1978}}{(S/E)_{i1978}}$$

This assumption contrasts with the known instability in S/E employment as a share of total employment of scientists and engineers (in both S/E and non-S/E activities) discussed in the Introduction to this report.

estimation of sectoral indexes

Indexes were derived for the business/industry sector from unpublished employment data from the Current Population Survey (CPS). Three-year moving averages were used to smooth out the large irregular fluctuations in these data caused by sampling variability. Indexes were derived for the universities and colleges sector from data from NSF institutional surveys.[3] Indexes were derived for the Federal Government sector from unpublished data acquired from the Office of Personnel Management. Indexes were derived-field for the "other" sector from CPS data. Like the indexes developed for the business/industry sector, three-year moving averages were used to minimize the effects of sampling variability.

estimation of primary work activity indexes

Indexes of the number of scientists and engineers employed primarily in research and development for each major sector were based on changes in the number of full-time equivalent scientists and engineers in research and development.[4] For the university sector, indexes of the number primarily employed in teaching were based on relative changes in the number of doctoral level scientists and engineers in universities and colleges who reported teaching as their primary work activity. Estimates of these changes were derived from the Survey of Doctorate Recipients maintained by the National Academy of Sciences under the aegis of the National Science Foundation.[5]

caveat

In this report, the estimates for years other than 1978 are based on the assumption that relation changes in S/E employment are equal to the indexes described above. Because of this assumption and because of the small sample involved in the CPS estimates used to develop indexes for the business/industry and the "other" sectors of the economy, these estimates should be used with caution. They are most credible as indicators of long-run trends; they do not represent precise estimates of year-to-year changes in employment levels.

data sources

Details on survey methods, coverage, concepts, definitions, and reliability of the data used to develop underlying trends are contained in the following reports:

Characteristics of Doctoral Scientists and Engineers, 1977 (Detailed Statistical Tables) (NSF 79-306).

U.S. Scientists and Engineers: 1978 (Detailed Statistical Tables) (NSF 80-304).

National Patterns of Science and Technology Resources, 1980 (NSF 80-306).

Human Resources for Scientific Activities at Universities and Colleges, January 1978 (Technical Notes and Detailed Statistical Tables) (NSF 78-316).

Current Population Survey. Detailed Occupational Index, Table 5. 1970-80. Department of Labor, Bureau of Labor Statistics, unpublished.

Personnel Data File 1970-80. Office of Personnel Management.

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[3] Annual estimates for the years 1970 and 1972 were not available from these surveys. They were generated by means of linear interpolation from data available for the years 1969, 1971, and 1973. Annual estimates for the years 1979 and 1980 were also not available from these surveys. They were generated by means of linear extrapolation of recent trends.

[4] For data on number of full-time equivalent scientists and engineers in research and development, see National Science Foundation, *National Patterns of Science and Technology Resources, 1980* (NSF 80-308) (Washington, D.C.: Supt. of Documents, U.S. Government Printing Office, 1980).

[5] For a detailed description of this Survey, see National Science Foundation, Characteristics of Doctoral Scientists and Engineers in the United States, 1979 (Detailed Statistical Tables) (NSF 80-323) (Washington, D.C., 1981).

appendix b

statistical tables

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Table B-1. Scientists and engineers by field: 1970-80

[In thousands]

Field	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980
Scientists and engineers, total	1,752	1,789	1,817	1,847	1,883	1,948	1,992	2,047	2,092	2,220	2,316
Scientists, total	657	681	708	741	764	803	849	869	891	906	956
Physical scientists	165	169	173	176	175	177	186	184	185	191	200
Chemists	105	110	113	117	117	118	128	125	126	130	137
Physicists/astronomers	47	46	47	46	46	46	45	44	44	45	47
Other physical scientists	13	13	13	13	12	13	13	15	15	15	16
Mathematical scientists[1]	38	35	36	33	37	38	39	43	43	46	47
Computer specialists	132	148	162	185	195	209	224	226	231	243	259
Environmental scientists	44	45	47	51	54	60	59	59	62	68	72
Earth scientists	37	38	39	44	45	51	51	51	53	58	63
Other environmental scientists[2]	7	7	7	8	8	9	9	8	9	9	10
Life scientists	154	159	162	162	164	169	184	194	202	193	201
Biological scientists	53	54	55	58	61	66	69	73	74	70	71
Agricultural scientists	64	66	67	65	63	63	75	81	85	79	84
Medical scientists	37	38	40	40	40	40	40	40	42	44	45
Psychologists	44	45	49	53	56	61	64	69	71	73	78
Social scientists	81	80	80	81	84	90	93	94	96	94	99
Economists	27	26	27	27	30	33	32	34	34	35	38
Sociologists/anthropologists	8	7	7	8	8	9	9	10	9	10	11
Other social scientists	47	46	46	46	47	48	51	51	53	49	50
Engineers, total	1,095	1,108	1,109	1,106	1,119	1,145	1,144	1,178	1,201	1,314	1,360

[1] Includes mathematicians and statisticians.
[2] Includes oceanographers and atmospheric scientists.
NOTE: Detail may not add to totals because of rounding.
SOURCE: National Science Foundation

Table B-2. Scientists and engineers by primary work activity and by sector: 1970-80
[In thousands]

Field	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980
Scientists and engineers, total	1,752	1,789	1,817	1,847	1,883	1,948	1,992	2,047	2,092	2,220	2,316
Total in research and development	521	528	535	543	550	561	577	605	632	662	694
Total in teaching (educational institutions)	135	145	149	149	160	169	177	189	194	196	197
Total in other	1,097	1,117	1,134	1,156	1,174	1,217	1,238	1,253	1,266	1,362	1,425
Educational institutions, total	250	261	266	266	276	290	304	317	326	336	352
Research and development	69	69	68	68	65	67	72	74	77	79	82
Teaching	135	145	149	149	160	169	177	189	194	196	197
Other	46	48	49	50	51	53	55	54	56	61	73
Industry, total	1,175	1,192	1,208	1,236	1,260	1,296	1,319	1,351	1,382	1,494	1,557
Research and development	375	380	385	391	394	396	407	430	451	477	504
Other	801	812	822	845	866	900	912	922	931	1,017	1,053
Federal Government, total	147	151	157	153	151	158	161	163	164	168	173
Research and development	49	47	45	43	44	45	45	45	46	46	47
Other	98	105	112	109	108	114	116	118	118	121	126
Other sectors, total	180	185	188	193	196	203	209	215	219	222	234
Research and development	28	32	37	41	47	53	53	56	58	59	61
Other	152	153	151	152	149	150	156	159	161	163	173

NOTE: Detail may not add to totals because of rounding.
SOURCE: National Science Foundation

Table B-3. Scientists and engineers by field in business and industry: 1970-80
[In thousands]

Field	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980
Scientists and engineers, total	1,175	1,192	1,208	1,236	1,260	1,298	1,319	1,351	1,382	1,494	1,557
Scientists, total	294	314	332	361	371	390	414	419	431	442	466
Physical scientists	89	93	95	98	97	98	105	103	102	106	111
Chemists	66	71	73	75	76	76	84	81	81	84	88
Physicists/astronomers	18	18	18	17	17	17	16	16	15	15	16
Other physical scientists	5	5	5	5	5	5	5	6	6	7	7
Mathematical scientists[1]	16	15	15	15	15	15	15	15	15	17	18
Computer specialists	96	110	121	140	149	158	167	168	172	180	192
Environmental scientists	22	24	25	28	29	33	32	31	33	37	40
Earth scientists	20	22	23	26	27	31	30	29	31	34	37
Other environmental scientists[2]	2	2	2	2	2	2	2	2	2	3	3
Life scientists	35	36	37	39	39	39	50	53	57	52	53
Biological scientists	9	9	9	9	10	11	11	12	12	9	10
Agricultural scientists	22	23	24	25	24	24	34	38	41	38	38
Medical scientists	4	4	4	5	4	4	4	4	5	5	5
Psychologists	10	11	13	14	15	17	17	20	21	22	23
Social scientists	27	26	26	26	28	30	29	30	30	29	31
Economists	12	12	12	12	13	16	15	15	16	16	17
Sociologists/anthropologists	2	1	1	2	2	2	2	2	2	2	2
Other social scientists	14	13	13	13	13	13	13	13	13	11	11
Engineers, total	881	878	876	875	886	907	905	933	952	1,052	1,091

[1]Includes mathematicians and statisticians.
[2]Includes oceanographers and atmospheric scientists.
NOTE: Detail may not add to totals because of rounding.
SOURCE: National Science Foundation

Table B-4. Scientists and engineers by field in educational institutions: 1970-80

[In thousands]

Field	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980
Scientists and engineers, total	250	261	266	266	276	290	304	317	326	336	352
Scientists, total	216	220	225	224	235	248	261	272	279	285	297
Physical scientists	47	47	48	49	49	49	50	51	53	54	56
Chemists	23	23	24	24	25	26	26	27	28	28	28
Physicists/astronomers	20	20	20	20	20	20	20	20	21	23	24
Other physical scientists	4	4	4	5	4	4	4	4	4	4	3
Mathematical scientists[1]	15	15	15	12	17	17	18	22	22	23	23
Computer specialists	11	10	11	9	11	13	15	15	17	20	23
Environmental scientists	9	8	8	9	10	10	11	12	12	13	14
Earth scientists	7	7	7	8	8	9	10	10	10	11	12
Other environmental scientists[2]	1	1	1	1	1	1	1	2	2	2	2
Life scientists	69	73	73	74	74	78	80	83	86	85	88
Biological scientists	34	36	37	38	40	43	45	49	49	49	50
Agricultural scientists	13	14	13	11	10	11	11	11	12	11	13
Medical scientists	22	24	24	25	24	24	24	24	25	25	25
Psychologists	29	30	32	34	36	39	39	41	43	43	45
Social scientists	36	38	38	38	39	42	45	46	47	47	50
Economists	10	11	11	11	11	12	12	13	13	14	15
Sociologists/anthropologists	5	5	5	5	6	6	7	7	7	7	7
Other social scientists	21	22	22	22	22	24	26	26	27	27	27
Engineers, total	34	41	41	42	41	42	43	45	47	51	55

[1] Includes mathematicians and statisticians.
[2] Includes oceanographers and atmospheric scientists.
NOTE: Detail may not add to totals because of rounding.
SOURCE: National Science Foundation

Table B-5. Scientists and engineers by field in the Federal Government: 1970-80
[In thousands]

Field	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980
Scientists and engineers, total	147	151	157	153	151	158	161	163	164	168	173
Scientists, total	73	71	73	72	72	75	77	79	79	79	82
Physical scientists	15	14	15	14	14	14	14	14	14	14	14
Chemists	8	7	8	7	7	7	7	7	7	7	7
Physicists/astronomers	5	5	5	5	5	5	5	5	5	5	5
Other physical scientists	2	2	2	2	2	2	2	2	2	2	2
Mathematical scientists[1]	3	3	3	3	3	3	3	3	3	3	3
Computer specialists	9	9	10	12	12	13	14	14	15	15	15
Environmental scientists	9	9	9	8	9	10	10	10	10	11	11
Earth scientists	6	5	5	5	5	6	6	7	7	8	8
Other environmental scientists[2]	3	3	3	3	3	3	3	3	3	3	3
Life scientists	30	31	31	29	29	29	29	30	30	29	30
Biological scientists	4	4	5	4	5	5	5	5	5	5	5
Agricultural scientists	24	25	24	23	22	22	22	23	23	22	23
Medical scientists	2	2	2	2	2	2	2	2	2	2	2
Psychologists	2	1	1	1	1	2	2	2	2	2	2
Social scientists	5	4	4	4	5	5	5	6	6	6	6
Economists	3	2	2	2	3	3	3	3	3	3	4
Sociologists/anthropologists	(3)	(3)	(3)	(3)	(3)	(3)	(3)	1	1	1	1
Other social scientists	2	2	2	2	2	2	2	2	2	2	2
Engineers, total	75	81	84	81	79	84	84	85	85	89	91

[1]Includes mathematicians and statisticians.
[2]Includes oceanographers and atmospheric scientists.
NOTE: Detail may not add to totals because of rounding.
SOURCE: National Science Foundation

Table B-6. Scientists and engineers by field in other sectors: 1970-80

[In thousands]

Field	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980
Scientists and engineers, total	180	185	188	193	196	203	209	215	219	222	234
Scientists, total	74	76	79	84	86	91	97	99	101	100	110
Physical scientists	15	15	15	16	15	16	16	16	16	17	19
Chemists	8	9	9	10	9	10	10	10	10	11	14
Physicists/astronomers	4	4	4	4	4	4	4	4	3	3	3
Other physical scientists	2	2	2	2	2	2	2	3	3	3	3
Mathematical scientists[1]	3	3	3	3	3	3	3	3	3	3	3
Computer specialists	17	18	20	23	23	26	28	28	29	29	30
Environmental scientists	5	5	5	6	6	7	7	7	7	6	7
Earth scientists	4	4	4	4	4	5	5	5	5	5	6
Other environmental scientists[2]	1	1	1	2	2	2	2	2	2	2	2
Life scientists	20	20	21	21	22	23	26	27	29	28	30
Biological scientists	6	6	6	6	7	7	7	8	8	7	7
Agricultural scientists	6	6	6	6	6	6	9	10	10	9	10
Medical scientists	8	9	9	9	9	10	10	10	11	12	14
Psychologists	3	3	3	4	4	4	4	5	6	6	8
Social scientists	13	12	12	13	13	13	13	13	13	13	13
Economists	2	2	2	2	2	3	3	3	3	3	3
Sociologists/anthropologists	1	1	1	1	1	1	1	1	1	1	1
Other social scientists	10	9	9	9	10	10	10	10	10	9	9
Engineers, total	105	109	109	109	110	112	112	116	118	122	124

[1] Includes mathematicians and statisticians.
[2] Includes oceanographers and atmospheric scientists.
NOTE: Detail may not add to totals because of rounding.
SOURCE: National Science Foundation

other science resources publications

Science Resources Studies Highlights

R&D Funds

	NSF No.	Price
"R&D Expenditures Increase 3% in Real Terms at Universities and Colleges in FY 1979"	81-304	-----
"Federal Academic Science Support Rose by 13% in FY 1979"	81-303	-----
"Federal R&D Obligations Will Show Real Growth in 1981—Mostly From DOD Programs"	80-322	-----
"March Cutbacks in Federal Budget Leaves Strong Defense R&D Growth in 1981—Other Areas Lag"	80-319	-----
"National R&D Spending Expected to Reach $67 Billion in 1981"	80-310	-----
"Federal Obligations to Universities and Colleges Continued Real Growth in FY 1978"	80-303	-----
"Greatest Increase in 1978 Industrial R&D Expenditures Provided by 14% Rise in Companies' Own Funds"	80-300	-----

S/E Personnel

"Employment Opportunities for Ph.D. Scientists and Engineers Shift From Academia to Industry"	81-312	-----

Detailed Statistical Tables

R&D Funds

Academic Science: R&D Funds, Fiscal Year 1979	81-301	-----
Federal Funds for Research and Development, Fiscal Years 1979, 1980, and 1981, Volume XXIX	80-318	-----
Research and Development in Industry, 1978. Funds, 1978; Scientists & Engineers, January 1979	80-307	-----
Research and Development in State and Local Governments, Fiscal Year 1977	79-327	-----

S/E Personnel

Scientists and Engineers From Abroad, 1976-78	80-324	-----
Characteristics of Doctoral Scientists and Engineers in the United States, 1979	80-323	-----
Academic Science: Graduate Enrollment and Support, Fall 1979	80-321	-----
Characteristics of Experienced Scientists and Engineers, 1978	79-322	-----

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R&D Funds

Federal Support to Universities, Colleges, and Selected Nonprofit Institutions, Fiscal Year 1979	81-308	$5.50
Federal Funds for Research and Development, Fiscal Years 1979, 1980, and 1981, Volume XXIX	81-306	$3.75

S/E Personnel

The Stock of Science and Engineering Master's Degree-Holders in the United States	81-302	-----
Employment Attributes of Recent Science and Engineering Graduates	80-325	$1.75
Scientists, Engineers, and Technicians in Manufacturing Industries, 1978-80	80-320	$2.00
Occupational Mobility of Scientists and Engineers	80-317	$1.75

Composite

Academic Science, 1972-77: R&D Funds, Scientists and Engineers, and Graduate Enrollment and Support	80-313	$4.25